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SUSTAINABLE LUXURY: THE NEW BLACK GOLD.

MATERIALS, COATINGS AND PROCESSES FOR SUSTAINABLE JEWELS

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ABSTRACT

The aim of the research is to investigate how sustainable design can help prestigious goldsmith companies struggling - due to the recently soaring price of gold - in identifying new strategies selecting materials for their jewel creation, so that the firms may preserve their market positioning as well as retaining their target audience, and focusing on new more eloquent and environmentally bearable opportunities. In fact, last years have been characterized by an increase in gold price and an economic crisis that is affecting many companies, in particular SMEs. On the other hand several reports and articles have extended the debate on sustainable consumption to luxury products: authors underline that luxury product manufacturers depend no longer uniquely on their name and their identity, but consider also, according to the demands of their consumers, the social and environmental dimensions. This research is applied to an Italian goldsmith company selected for a European research project (2011-2013), aimed at supporting French and Italian SMEs into conceiving innovative environmental sustainable products and processes, which should be assumed as the key drivers for future development. The rationale behind this research and collaboration lied in several aspects, such as demonstrating that luxury lives in the project and not only in materials, improving the environmental profile of jewels is possible by probing materials to be paired with gold, enhancing innovation in jewels production, strengthening jewel brand identity and confirming the relationship with the legacy of traditional company's jewels.

Keywords: materials experience, materials for sustainability, sustainable luxury, materials for behavioural change.

1 INTRODUCTION

In these years, we are living in a contingent period, characterized by an economic crisis: micro and small-medium enterprises play an important role in boosting economic recovery and a pivotal role in the post-recovery economic landscape. This paper presents a case study about an Italian local prestigious goldsmith SME-company (number of employees < 250) struggling like many others due to the recently soaring price of gold (De Giorgi 2014b). In fact "the increase in gold price has been of over 400% between 2002 and 2012, due to a shift towards safe investments in a period of crisis in the global economy" (Seccatore et al. 2014):

"since 2001, the price of gold has skyrocketed from a level of US\$ 250 per troy ounce to an all-time high of US\$ 1900 in August 2011, before falling substantially to around US\$ 1200 at the end of June 2013" (Białkowski et al. 2014).

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In literature and on the market several debates on sustainable consumption of luxury product have been presented and introduced (Achabou and Dekhili, 2013); in fact not only luxury brands but also producers of luxury products, particular high quality jewels and clothing, convey today humane and environmental values to establish a relationship with consumers. According to Kim et al. (2012), luxury product manufacturers can improve their identity and quality by pursuing a sustainable development also according to their consumers awareness of social and environmental issues.

Different researches and several articles underline the difficulty and the divergence in terms of values between luxury and sustainable development (Achabou and Dekhili, 2013; Lerma, 2013). In fact, also in our investigations¹ on the contemporary luxury landscape a weak association between semantic areas of sustainability and elegance has been proved; on the contrary, the strong association between higher costs and product quality has been reconfirmed (Lerma 2013). But several scholars such as Lochard and Murat (2011), support on the other hand the idea that the two concepts are compatible: the sustainability of the project must be presented as a new form of elegance, as an added value to the product, to be universally recognized. Moreover, "sustainable luxury is about respect for the social and environmental aspects of production and consumption. Luxury products need not wreak destruction on the environment and the communities who manufacture them" (Gardetti and Girón, 2014).

The aim of this paper is to investigate how sustainable design can help prestigious goldsmith companies having financial difficulties in identifying new strategies selecting materials for their jewel creation, so that the firms may preserve their luxury levels and their market positioning as well as retaining their target audience, and focusing on new more eloquent and environmentally bearable opportunities: as introduced, this research is applied to an Italian goldsmith company selected for a European research project (2011-2013), aimed at supporting French and Italian SMEs into conceiving innovative environmental sustainable products and processes, which should be assumed as the key drivers for future development.

2 MATERIALS AND METHODS

2.1 THE RESEARCH CONTEXT

The paper deals with the research dedicated to one of the case studies selected within the European research project EDEN EcoDesign Network Cross border Network aimed at the engineering of eco-compatible product (2011-2013), included in the Interreg-Alcotra Programme 2007-2013. Specifically, the EDEN project is aimed at supporting Piedmont SMEs' realization of innovative environmentally sustainable products and processes; these are to be deemed keys to their future development. The project is organised in two levels (De

¹ The theme of the perception of sustainability/luxury have been analysed in POLIEDRO, Pollenzo Index environmental and economics, research underway, funded by the Piedmont Region (Social and Human Sciences Call for Tender), which involved research units belonging to different institutions: University of Gastronomic Sciences, Polytechnic of Turin (DIPRADI Department of Architectural and Industrial Design), University of Studies of Turin (Department of Commodity Sciences, Department of Social Sciences and the Department of Business Administration).

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Giorgi, Dal Palù, Allione 2014). The first level urges SMEs to confront environmental issues and stimulates them to adopt an ecodesign approach, which takes into account the environmental life cycle performances. The second level aims at supporting and leading companies into developing and engineering new products/processes that may be more environmentally sustainable and commercially viable. These selected companies are related to different product groups such as: wood furniture, taps and fitting components, jewellery, EPS semi-finished products, educational toys and food packaging. They are presented as six case studies. By working on these case studies, and by adopting eco-design strategies such as material substitution, application in new fields or the conversion of some manufacturing activities into green processes, it is possible to demonstrate how ecodesign strategies can be improved not only in their individual environmental performances but also inasmuch they enhance the brand identity of the companies. The researches and the activities presented here, focused within the local Piedmontese context, represent an important reference for the national and international authorities and companies and we deem they can also be replicated in other territorial contexts. The study and analysis methods, going from Exploring to Systemic and to Social Design, applied in the case studies can, in fact, be implemented in different local contexts in the future, in order to define growth and eco-innovation strategies, developing future possible activities, products, service and processes particularly attentive to the environment and socially active (Ceppa, Lerma 2014).

2.2 THE CASE STUDY

As indicated above, the research presented in this paper is focused on a specific case study, an Italian goldsmith company that produces jewellery for its own product line and several other famous international brands: Mattioli (fig.1). The Mattioli brand has built its own current successes on the foundations of a noble past, associated with the most famous and masterful goldsmithing tradition of Torino², in fact Mattioli's history is rooted in the Antica Ditta Marchisio, established in Turin back in 1860. Mattioli launched her own brand in 2000 showcasing jewels that stand out for their contemporary and soft shapes, as well as for the balance between craftsmanship quality and innovation in materials and technologies (De Giorgi 2014b). Mattioli is always looking for new technologies and new processes resulting from the blend of different sectors, taking into account environmental sustainability: the challenge is to introduce eco-sustainability in luxury jewellery, finding and testing materials to use with gold (De Giorgi, Dal Palù, Allione 2014).

² <http://en.mattiolioielli.it>

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AN OVERVIEW OF MATTIOLI PRODUCTION



MATERIALS AND COLORS



gold: yellow, white, red



jet, diamond, mother of pearl, abony

INNOVATION →



gold 'chocolate'



ceramic, coral paste, ...

Figure 1 – Mattioli: an overview of the production

2.3 METHODS

The research focused on the case study (fig.2) previously presented, has been organized by the research team in 4 main steps, each of them using specific methodologies:

1. Adopting the Exploring Design path (Germak, De Giorgi 2008), a background analysis of the jewel pointed out both the stereotypes shared by every jewel, and new possible options representing an innovation in this field. This overview focused on materials, processes, sustainability, relationships with the productive district and new parts that could complete or coordinate with a jewel: it's the "jewel scenario analysis", focused in particular on materials used in the jewels production, with the aim to detect stereotypes linked to the preciousness and possible alternatives for the jewellery field, to be perceived as "precious". In this phase various aspects of the jewellery sector have been analysed, such as materials to substitute gold or to be matched with gold; different technologies and jewel making typologies; new elements that could integrate or to be put close to the jewel in general. All these aspects have been studied with a cross attention to the sustainable aspects on jewel making processes and production and on the "sustainability perception" value, and on the connections between the precious product and its territory, concerning materials, finishings and languages;
2. An analysis on the perception of the jewel through research sessions with a panel guided by a cognitive ergonomics specialist has been carried out, also by using the eye-tracking device that examined the attendees' reactions to the firm-case study's jewels, to establish paradigms of preciousness, innovation and sustainability;

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3. Some meta-project suggestions in terms of material innovations (such as the introduction, nearby gold, of light alloys), processes (as adopting ground-breaking technologies that permit to achieve complex and detailed shapes though preventing productive waste), finishing (for example turning "cheap" materials into precious just by using a black-coloured finishing) have been hypothesized, following the main guidelines and principles of Ecodesign;
4. Through a prototyping phase and some mechanical tests, the hypotheses of innovation have been verified. The excellent results achieved allowed to create a first set of jewels currently subjected to some early commercial testing.

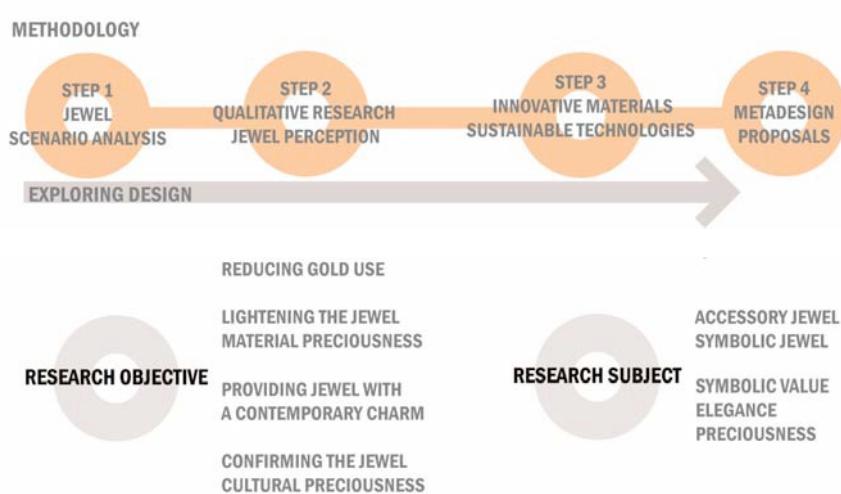


Figure 2 – An overview of the research subject and the adopted methodology

2.3.1 The Exploring Design path

According to the most advanced orientation of design culture, the design processes respond to the economic crisis that has hit countries in the west in recent years by generating new working methods, in order to face the weaker role of the traditional customers and define products and service for the future. At Politecnico di Torino, in the very recent past, part of the research for education regarded focusing on an evolved methodological model (Germak, De Giorgi 2008; Lerma, De Giorgi, Dal Palù 2014): by following this model a complete scenario analysis has been developed in order to understand the actual production of the company-case study and to define the possible development lines. The research team defines a process scenario that takes into account key details such as company history, currently used technologies, flow of materials and adopted strategies in order to assess the company's starting level of innovation and ecological mind-set (De Giorgi 2014). In particular the actual production of the company-case study has been analysed, as well as the competitors' products, in terms of innovation, materials, sustainability and processes. Moreover, according to the Ecodesign guidelines (Tamborrini 2009; Vezzoli, Manzini 2007; Vezzoli 2013; Lerma, De Giorgi, Allione 2011; Lanzavecchia, Barbero, Tamborrini 2012), focusing in particular on the territory (in particular in this case, the Piedmont Region).

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2.2.2 Analysis on the perception of the jewel

This part of the research has been carried out thanks to sessions group of tasters (8 people, different ages...), and has been organized in the following steps:

- a. Quantitative/qualitative phase. This phase has required a questionnaire to be given online to a pre-defined target, to obtain objective answers to some fundamental questions, necessary to orientate the research activity. In particular, this activity helped in outlining stereotypes and inclinations towards some different precious/not precious materials, possible materials combinations and matching, possible coatings, finishings and colours. This phase has to be considered as a preparatory step for the following research phases.
- b. Creative phase. This research phase has been aimed at identifying the "weak signals" that can be hidden behind the "precious jewel" concept (in order to better understand the value and the role that gold could assume in a contemporary jewel), and also innovative moods and trends that could contribute to generate new ideas and concepts referred to new materials, shapes, perceived quality of the precious jewel.
- c. Eye-Tracking³ machine activity phase. In this phase, the participants used Eye Tracking machine to look at jewels in general and at Mattioli jewels, listening to some specific "stimuli", that is to say, for example, "sustainability", or "innovation". This activity allowed to understand in an objective way which are the elements (materials, colours, shapes, finishings..) that could evoke some aspect such as "luxury", "preciousness", "innovation", or "sustainability".

3 RESULTS AND DISCUSSION

The results of this analysis are the following:

- Analysis of the jewel perception, with cognitive sessions supported by the Eye Tracking machine technique. This specific research gave birth to four distinct aspects of the jewel, that seem to be four possible ways to read and to perceive jewels: the "Elegance", which seems to focus on added elements, such as diamonds and other precious stones; the "Preciousness" emerged as a category which has to be searched both in the shape and in the precious added elements (both the previous categories were sensible to some particular colours); the "Symbolic aspect" and the "Accessory jewel", which emerged as categories more free from stereotypes.
- Development of meta-project suggestions related in particular to the "Symbolic jewel" and "Accessory jewel", but useful also for the other two categories in terms of chromatic solutions, related to materials, technologies and finishing.

³ Analytic technique involving the recording of eye movements made by the person during the observation of an object or while browsing a web site.

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The proposals defined by the research team (fig. 3) are linked to environmental and material lightness, territory and different productive chains. More in details (De Giorgi 2014b) the choice is about light alloys used in the aeronautics and aerospace fields (aluminium and titanium alloys); in fact, Mattioli territorial location also houses an international outpost of aerospace fields.

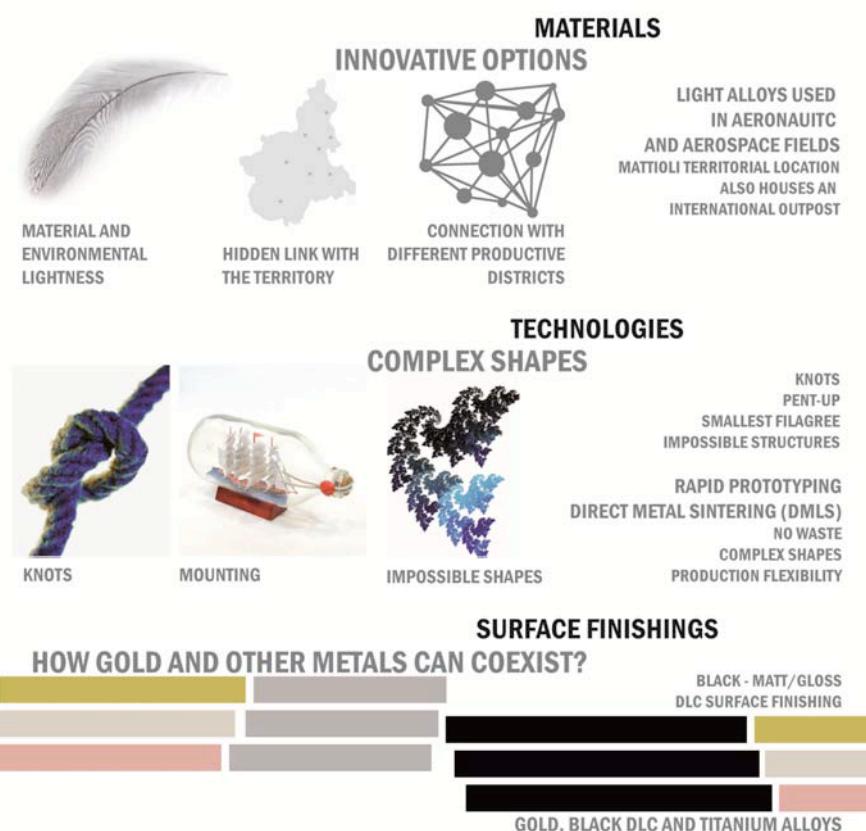


Figure 3 – Metadesign proposals

These materials can be transformed through innovative technologies, such as the rapid prototyping. Moreover, such alloys lend themselves to convey the spirit of the territory whose Mattioli stands for, as well as simultaneously interpreting both today's paradigms of complexity and fluidity and the resulting stylistic elements (the "impossible shapes") through processing technologies that enable production flexibility and cost control.

According to previous background analysis about jewels and Mattioli jewels, the recently soaring price of gold and the considerations following the eye-tracking analysis (on jewels and other products) about the importance of elegance (Buiatti 2013), the research group defined several ways in which gold can coexist with other metals: the main proposal focused on the surface finishing, which can transform the visual perception of the material, while retaining its intrinsic characteristics. In particular the defined finishing colour is black: this colour, in fact, is generally linked to semantic areas of elegance and preciousness (Buiatti 2013). This solution has been defined in order to maintain the Mattioli corporate identity and elegance: the focus was then placed on surface finishing available with a specific advanced finishing technique (DLC), similar to PVD, but more performing (Maleck De Oliveira Cabral 2013), used in

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healthcare and automotive fields and able to ensure biocompatibility, wear and corrosion resistance and availability to carry both a matt or glossy finishing.

Specifically, the hypothesis of black finishing has been evaluated through a prototyping phase and several mechanical tests (Maleck De Oliveira Cabral 2013). The DLC process is a plasma-assisted chemical vapour deposition (PACVD) technology used to apply the diamond-like carbon to the watches; moreover Diamond-like carbon, or DLC, is amorphous carbon plasma - a material that exhibits astounding properties whose, for years, have benefitted a variety of industries including aerospace, military, medical and automotive industries that constantly demand new heights of material innovation.

The technologic transfer operated from these sectors to the jewel sector could provide some alternatives to the tradition in order to emphasize the "project value" and the "innovation value", instead of the traditional material preciousness.

Several tests on different project phases have been carried out to verify not only the aesthetical quality of the DLC coating, but also the improvement (due to DLC) of mechanical and physical surface properties in the prototypes made in not precious alloys.

The experimental activity has been conducted in the department laboratories of the Politecnico di Torino, and has concerned a ring (already existing, part of a Mattioli collection). First of all, mechanical tests have been carried out, realizing this ring in different alloys, with copper, beryllium, steel, aluminium and titanium, in order to evaluate the surface resistance of the DLC finishing. Further tests have been carried out also coating with black rodium via galvanic elettrodeposition the ring; other samples have been coated with layers of amorphous hydrogenated carbon (DLC). All the samples have been submitted to the same wear test, and then compared: the samples have had undergone tumble finishing and have been observed at steps of 1, 2, 3, 5, 10, 15 and 25 minutes.

All the samples coated with DLC presented a better wear resistance and a more dark and homogeneous black colour.

4 CONCLUSION

Mattioli jewellery firm is now evaluating the opportunity to introduce this innovation in its lines, providing to new products the correct price positioning strategy and organizing a dedicated communication system able to reach customers and buyers in the correct way, that it means to emphasize the requirements of the whole research: the materials experience concept, new materials for sustainability, luxury in the project, materials for a behavioural change and evolution.

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